

WHAT IS CLAIMED IS:

1. A photomask for near-field exposure,
comprising:

a substrate; and

5 a membrane portion supported by the substrate
and having on one side of the membrane portion a
shielding membrane that has a micro aperture,

wherein the photomask has such a structure as
to relieve stress that is generated at a border
10 between the membrane portion and the substrate when
the membrane portion is sagged.

2. A photomask for near-field exposure
according to claim 1, wherein the structure disperses,
15 over the membrane portion, deformation of the
membrane portion at the border between the membrane
portion and the substrate.

3. A photomask for near-field exposure
20 according to claim 2, wherein the structure has a
thick part in a region of the membrane portion that
abuts the border between the membrane portion and the
substrate.

25 4. A photomask for near-field exposure
according to claim 3, wherein the structure is such
that the thickness of the membrane portion is

increased toward the border between the membrane portion and the substrate.

5 5. A photomask for near-field exposure according to claim 1, wherein the structure is such that the thickness of the shielding membrane around the membrane portion is larger than that in the center portion of the membrane portion.

10 6. A photomask for near-field exposure according to claim 1, wherein the structure is composed of a reinforcing member placed at the border between the membrane portion and the substrate.

15 7. A photomask for near-field exposure according to claim 1, wherein the structure is composed of another layer provided on the shielding membrane around the membrane portion.

20 8. A photomask for near-field exposure according to claim 2, wherein the structure is an intermediate layer that is formed between the substrate and the membrane portion and stretches toward the membrane portion side.

25 9. A photomask for near-field exposure according to claim 1, wherein the structure disperses,

over the substrate, deformation of the membrane portion at the border between the membrane portion and the substrate.

5 10. A photomask for near-field exposure according to claim 9, wherein the structure is such that the thickness of the substrate is increased toward the border between the membrane portion and the substrate.

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11. A photomask for near-field exposure according to claim 1, wherein the structure splits vertical displacement caused by sagging of the membrane portion between at least two locations.

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12. A photomask for near-field exposure according to claim 11, wherein the structure is a deformable concave portion or a hole structure that is formed in a region around the membrane portion and/or in the substrate.

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13. A photomask for near-field exposure according to claim 12, wherein the concave portion is filled with a material other than that of the substrate.

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14. A photomask for near-field exposure

according to claim 11, wherein the structure is a movable portion that is formed outside the substrate along the border between the membrane portion and the substrate.

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15. A photomask for near-field exposure according to claim 14, wherein, when the membrane portion is sagged, the movable portion changes the position of the substrate to cause vertical
10 displacement of the membrane portion.

16. A photomask for near-field exposure according to claim 15, wherein the vertical displacement of the membrane portion which is caused
15 by the movable portion is larger than the sagging amount of the membrane portion.

17. A photomask for near-field exposure according to claim 14, wherein the movable portion is
20 an elastic hinge structure.

18. A photomask for near-field exposure according to claim 14, wherein the movable portion is a blade spring.
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19. A near-field exposure method for exposing an object to be exposed to light, comprising the

steps of:

fitting a shielding membrane of a photomask for near-field exposure to the object; and

5 irradiating the object with light from a light source through the shielding membrane, the photomask being composed of a substrate and a membrane portion that is supported by the substrate and has on one side of the membrane portion the shielding membrane, the shielding membrane having a micro aperture,

10 wherein the photomask has a structure for relieving stress that is generated in the border between the membrane portion and the substrate when the membrane portion is sagged.

15 20. A near-field exposure apparatus comprising:
a light source;
a stage on which an object to be exposed to light is placed; and

20 a photomask composed of a substrate and a membrane portion, the membrane portion being supported by the substrate and having on one side of the membrane portion a shielding membrane that has a micro aperture,

25 wherein the shielding membrane is brought into close contact with the object placed on the stage so that the object is irradiated with light from the light source through the shielding membrane for

exposure, and

wherein the photomask has a structure for relieving stress that is generated in the border between the membrane portion and the substrate when

5 the membrane portion is sagged.